ONTARIO. MINISTRY OF THE ENVIRONMENT

# ALGAE COUNTER'S REVIEW

1965

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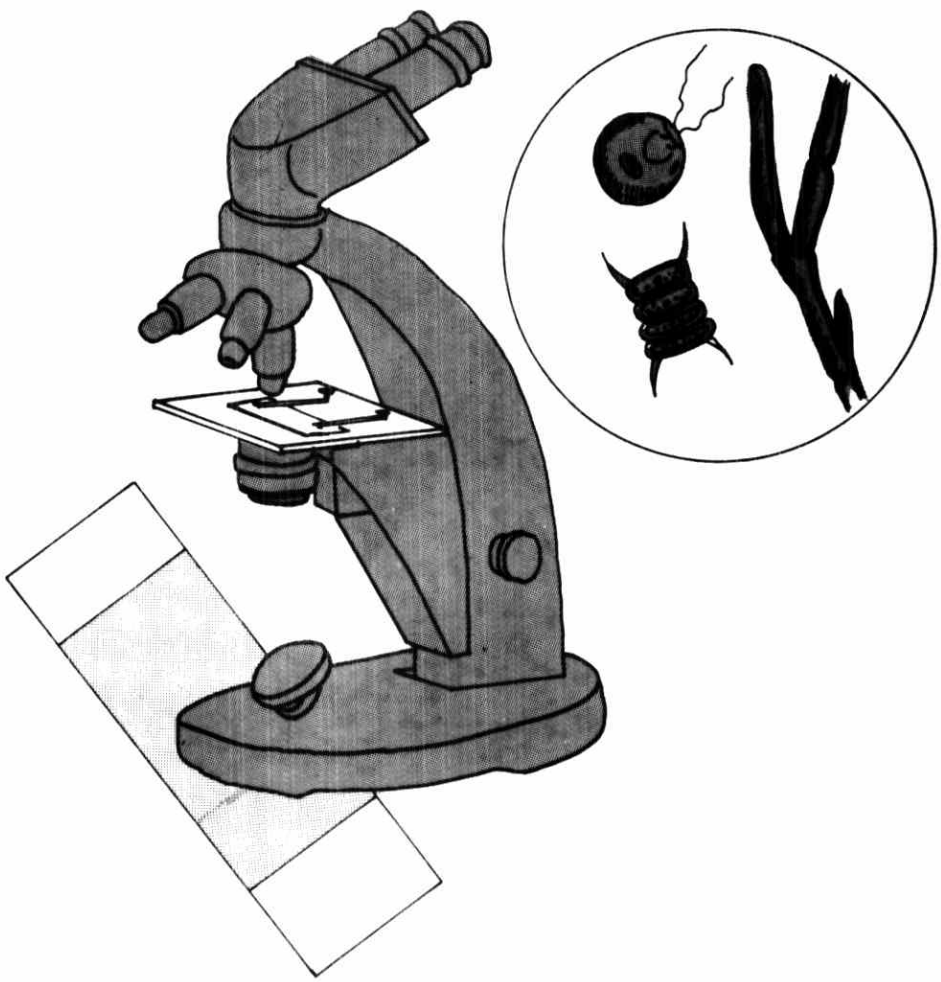
A BULLETIN PREPARED FOR MUNICIPALITIES WHICH HAVE ESTABLISHED A REGULAR ALGAE COUNTING PROGRAM



**Ontario Water Resources Commission**

Division of Laboratories

Biology Branch

## ALGAE ENUMERATION COURSE TO BE OFFERED

The Commission once again will be offering an Algae Identification and Enumeration Course, during the period November 22-26. Apart from several municipalities that will be sending representatives to this course, a graduate student from Trent University will be in attendance, along with a representative from the Department of National Health and Welfare.

Recent studies completed at the OWRC have demonstrated that, for most bodies of water in Ontario, the use of a concentration procedure is essential if statistically accurate counts are to be obtained. Experiments with centrifuging, the millipore filter technique and the Sedgwick-Rafter concentrating funnel have demonstrated that the latter is the most accurate and most practical method of concentrating for the average water treatment plant. For persons who have previously attended our algae course, it is our intention to send one of our staff members to the various plants to demonstrate this innovation which involves little cost insofar as additional equipment is concerned.

## OTHER INFORMATION USEFUL IN RECORDING ALGAE COUNTS

While records of algae counts are in themselves indispensable when carried out on a regular basis, their value can be greatly enhanced by the inclusion of related information on the record sheet. The quantity of information recorded has varied greatly in different municipalities. Useful data which should be included when ever possible, is as follows:

- water temperature at the time the sample was taken
- length of filter runs (if filters present)
- description of any taste or odour and if possible a threshold odour value
- chlorine application and post-chlorine residual
- colour
- turbidity.

Since weather is an important influencing factor on the results of algae enumerations, particularily in the Great Lakes, indications of rough or stormy weather should be included on the report sheets. For records forwarded to the OWRC laboratory, it would be of great assistance if operators undertaking the enumerations could include separate a.s.u. values for the green, blue-green, diatom and flagellate groups.

## SUMMARY OF ALGAE COUNTS SUBMITTED BY PROVINCIAL CO-OPERATORS

During 1964 regular algae enumerations were undertaken at several water treatment plants by waterworks operators. A graph was made based on the monthly averages for counts at the following locations:

Belleville
Peterborough
Dunnville
Smith Falls
Cornwall

As we expected, the highest totals expressed in areal standard units per ml. were obtained at Belleville. During January, February, March and April, counts at this municipality ranged from 2,026 - 7,120 a.s.u./ml. On May 12, the total count of 10,785 a.s.u. was dominated by the diatoms Tabellaria and Melosira. Throughout the rest of May and June counts varied between 4,642 - 9,673 a.s.u./ml. with Anabaena, Chlorella and Melosira dominating. On July 6, the total of 11,844 a.s.u./ml. was made up almost entirely of blue-greens. From this date on, the total count increased steadily, reaching a peak of 20,174 on September 10. On this date the count included both blue-greens and diatoms. For the remainder of the year the total counts decreased slowly as the blue-greens declined and the diatoms took over.

The high enumerations at this station definately attest to the importance of the microstrainers which enable Belleville to process water from the highly productive Bay of Quinte.

High levels of algae are experienced at Peterborough, also. During January, 1964, total counts as high as 19,715 a.s.u./ml. were obtained. The principal genera in these enumerations were Fragillaria,

MONTHLY AVERAGES OF TOTAL COUNTS FOR 1964

Asterionella and Anacystis. High levels of the latter at this time of the year are somewhat unusual. Counts dropped off markedly in the latter part of February. In april, high counts ranging from 8,310 - 15,599 contained approximately equal numbers of greens, flagellates and diatoms, with lower levels of blue-greens. In the months of May, June, July and August diatoms and blue-greens dominated the relatively low counts. During September, the total a.s.u./ml. increased up to 7,300, consisting chiefly of blue-greens (Oscillatoria, Anabaena and Anacystis). Throughout the remainder of 1964, total counts did not exceed 4,000 a.s.u./ml.

At Dunnville, algae enumerations varied between 115 and 615 a.s.u./ml. during January and February. As expected for this time of year diatoms dominated the picture. On March 27, the count of 4,961 a.s.u./ml. was caused by an increase of blue-greens (mainly Anacystis) and the diatoms Tabellaria and Melosira. The next enumeration on April 9 produced a high count of 10,128 a.s.u./ml. The diatom Melosira was the chief component at this time. During the remainder of the year, total counts fluctuated between 190 and 2,031 a.s.u. In Lake Erie, it has been demonstrated that high algae counts generally occur during spring and fall, usually caused by increases in the numbers of diatoms. This is referred to as a bimodal pattern of seasonal development.

The graph illustrates the low levels of algae that are experienced at Smith Falls and Cornwall the year round. At Smith Falls the highest count (1,040 a.s.u./ml.) was reached on April 16 when the flagellates increased to 925 a.s.u./ml. Blue-greens were almost completely absent throughout the entire year. Smith Falls obtains its water from the Rideau system and in spite of low levels of algae, often utilizes activated carbon for taste and odour control. This is undoubtedly necessitated by the presence of prolific growths of submergent aquatic plants in the Rideau River which excrete objectionable waste products and which cause water to become odouriferous when they die back each fall and subsequently undergo decomposition.

At Cornwall the peak count of 696 a.s.u./ml. was reached on March 30 and was composed almost entirely of diatoms. Except for August and September, blue-greens were absent. Green algae were not present in significant quantities. Peridinium was the most abundant flagellate and Synedra, Melosira, Tabellaria and Cyclotella were the most prevalent diatoms. Cornwall obtains its water from the St. Lawrence River. Marked differences are apparent in the levels of algae in the river as compared to Lake Ontario from which it flows.

## USE OF COPPER SULPHATE AT SUDBURY

Threshold odour levels approaching 300 in the water supply at Sudbury prompted the Commission to recommend the use of copper sulphate in treating Ramsey Lake, source of supply for the city. High odour levels have persisted for some time and irate citizens have been demanding positive remedial action.

Water volumes in the western half of Ramsey Lake have been determined by the Biology Branch of the Commission. At the time of writing, the algicide is about to be applied at a rate of .5 ppm. Altogether, 20 tons of the chemical will be applied to the lake by a light, fixed-wing aircraft.

Plans are in effect to determine the effectiveness of the control operation by relating copper analyses to algae counts and threshold odour levels in the area treated. A six-day supply has been left untreated in the vicinity of the intake to provide for the disappearance of distasteful decomposition products that will develop as the algicide takes effect.

## SUMMARY OF PAPER PRESENTED AT EIGHTH CONFERENCE ON GREAT LAKES RESEARCH

Evaluation of data accumulated at the Toronto Island Filtration Plant from 1923 to 1954 indicated that the level of plankton approximately doubled during this period. Coincidentally, increasing levels of free ammonia, chlorides, hardness and turbidity were experienced and these continued to increase up to 1964. Turbidity levels and concentrations of

free ammonia in the 'raw' water were substantially greater than results obtained farther out in the lake.

The mean increase of plankton was computed at 5.6 areal standard units per annum. Well-defined spring maximum and winter minimum populations were apparent nearly every year, but fall maxima developed inconsistently and were characterized by lower levels of abundance than the spring pulses.

CONCENTRATING SHOWN TO BE ESSENTIAL IN ALGAE COUNTING WORK

Repetitive enumerations at the Commission laboratory have demonstrated the need for a suitable concentrating procedure in order to increase the accuracy of algae counting. Comparisons of repeat counts by the same person on unconcentrated test samples and with results obtained by several enumerators have shown that truly representative counts cannot be obtained except for genera that are present in large numbers. While an unconcentrated method of counting is generally satisfactory for demonstrating what genera may or may not be on the increase, it is not sufficiently reliable if results are to be used to reflect long-term changes on the productivity of water. It is hoped that data accumulated at water treatment plants where algae counting is undertaken on a routine basis will supplement information that results from investigations and sampling programs undertaken by the Commission.

Several methods of concentrating were tested at the laboratory, including centrifuging and the millipore filter method. The former method appeared to be too subject to error and somewhat complicated for personnel at water treatment plants. The millipore filter technique proved to be fast and relatively simple. However, difficulties were experienced in rendering the filter suitably transparent to enable sufficient light to pass through from the light source so that the algae could be seen with optimum clarity. Also, it was often apparent that the organisms were not randomly distributed on the filter. Additional work was completed using the Sedgwick-Rafter funnel method and it was found that reasonably reproducible results could be obtained with this technique. Considering everything, it would appear that the Sedgwick-Rafter funnel method affords the best means of concentrating for waterworks operators considering the accuracy of results and the fact that the equipment required is quite inexpensive.

Date Due

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